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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/686,849	10/16/2003	Anton Mauder	MUH-12841	1748
24131	7590	10/14/2005	EXAMINER	
LERNER AND GREENBERG, PA P O BOX 2480 HOLLYWOOD, FL 33022-2480			PHAM, LONG	
			ART UNIT	PAPER NUMBER
			2814	

DATE MAILED: 10/14/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No. 10/686,849	Applicant(s) MAUDER ET AL.	
	Examiner Long Pham	Art Unit 2814	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 29 July 2005.
- 2a) ☒ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1, 5, 8-29 and 32-37 is/are pending in the application.
- 4a) Of the above claim(s) 24-29 and 32-37 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1, 5, and 8-23 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                        | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)    | Paper No(s)/Mail Date. _____  |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____   | 6) <input type="checkbox"/> Other: _____                                    |

### DETAILED ACTION

The request for rejoinder of method claims 24-29 and 32-37 will be considered upon allowance of present rejected claims.

#### Rejections and/or objections necessitated by the amendments

##### *Claim Rejections - 35 USC § 103*

1. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

1. Claims 1, 5, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sato et al. (US patent 6,440,828) in combination with Cheng et al. (US patent 5,873,984), and Slater, Jr et al.

With respect to claim 1, Sato et al. teach a contact configuration, comprising (see the abstract and claims 1-8):

a semiconductor body of monocrystalline silicon;

a refractory metal layer; and

a layer of amorphous silicon disposed between the semiconductor body and the refractory metal, for forming an ohmic contact between the refractory metal layer and the semiconductor body.

Sato et al. appear to fail to teach doping the amorphous silicon with hydrogen.

Cheng et al. teach doping amorphous silicon with hydrogen to improve mechanical property. See col. 2, lines 25-30.

It would have been obvious to one of ordinary skill in the art of making semiconductor devices to dope the amorphous silicon of Sato et al. with hydrogen to obtain the above advantage.

With respect to claims 5 and 8, Sato et al. further teach the semiconductor body is a n or p type conductive region. See col. 7, lines 1-10.

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With respect to claim 12, the use of aluminum, chromium, or aluminum/chromium in forming ohmic contact is well-known.

With respect to claims 13 and 14, the incorporation of trench component comprising of diode, bipolar transistor, MOSFET, and IGBT is well-known.

With respect 15, Sato et al. further teach a field stop zone in the semiconductor body adjoining the layer of amorphous silicon. See the abstract.

With respect to claims 16, 17, and 18, the incorporation of an emitter which has the same or opposite conductivity type as the semiconductor body for forming IGBT is well-known. Further, the formation of an ohmic contact in the area of an emitter of IGBT is well-known.

With respect to claim 19, it is submitted that if an emitter is incorporated into the semiconductor body of Sato et al. the emitter would inherently form a schottky or ohmic contact with high contact resistance in the absence of the amorphous silicon layer.

With respect to claim 20, the formation of ohmic contact in rear or front of a semiconductor body is well-known.

With respect to claim 21, it is submitted that since Sato et al. teach an ohmic contact having an amorphous silicon layer, the injection of charge carriers would inherently attenuate.

With respect to claim 22, the crystallization of amorphous silicon is well-known.

With respect to claims 9 and 10, Sato et al. fail to teach the range for the thickness of the amorphous silicon layer.

However, it would have been obvious to one of ordinary skill in the art of making semiconductor devices to determine the workable or optimal range for the thickness of the amorphous silicon layer through routine experimentation and optimization to obtain optimal or desired device performance because the thickness

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of the amorphous silicon layer is a result-effective variable and there is no evidence indicating that it is critical or produces any unexpected results and it has been held that it is not inventive to discover the optimum or workable ranges of a result-effective variable within given prior art conditions by routine experimentation. See MPEP 2144.05.

With respect to claim 11, Sato et al. fail to teach the range for the concentration of the amorphous silicon layer.

However, it would have been obvious to one of ordinary skill in the art of making semiconductor devices to determine the workable or optimal range for the concentration of the amorphous silicon layer through routine experimentation and optimization to obtain optimal or desired device performance because the concentration of the amorphous silicon layer is a result-effective variable and there is no evidence indicating that it is critical or produces any unexpected results and it has been held that it is not inventive to discover the optimum or workable ranges of a result-effective variable within given prior art conditions by routine experimentation. See MPEP 2144.05.

With respect to claim 23, Sato et al. fail to teach that the layer formed between the metal layer and semiconductor is made of silicon carbide.

Slater, jr et al. teach forming a silicon carbide between a silicon carbide substrate and a metal layer to obtain an ohmic contact which is economic to make. See claim 1 and [0016].

It would have been obvious to one of ordinary skill in the art of making semiconductor devices to replace amorphous silicon with silicon carbide to achieve the above advantage.

### ***Response to Arguments***

2. Applicant's arguments with respect to claims 1, 5, and 8-23 have been considered but are moot in view of the new ground(s) of rejection.

In response to the applicant's arguments in the bottom paragraph on page 11 and the top paragraph on page 12 of the amendment filed 07/29/05, it is submitted that the fact that the applicants have a different reason or advantage resulting from doing what the relied prior art suggested doing is not indicative or demonstrative of unobviousness. In *Re Kronig* 190 USPQ 425,428 (CCPA 1976); In *Re Lintner* 173 USPQ 560 (CCPA 1972). Also, the prior art motivation or advantage may be different than that of applicants while still supporting a conclusion of obviousness. In *Re Wiseman* 201 USPQ 658 (CCPA); *Ex Parte Obiaya* 227 USPQ 58 (Bd. of App. 1985).

In response to the applicant's arguments in the bottom paragraph on page 11 and the top paragraph on page 12 of the amendment filed 07/29/05, it is submitted that Slater, jr et al. teach replacing doped amorphous silicon with silicon carbide to economically form an ohmic contact.

#### ***Conclusion***

3. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Long Pham whose telephone number is 571-272-1714. The examiner can normally be reached on M-F, 7:30AM-3:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on 571-272-1705. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Long Pham  
Primary Examiner  
Art Unit 2814

LP